

NOTES ON THE BEMBICID, *STICTIELLA PULLA*  
(HANDLIRSCH)

(Hymenoptera)

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During the summer of 1939, the author was able to spend some time in the cricket fields of northern Nevada, and to observe, among other things, some of the interesting behavior of the small yellow-and-black burying bembicid, *Stictiella pulla* (Handlirsch).<sup>1</sup> It was while watching the large black cricket wasp, *Chlorion laeviventris* (Cresson)<sup>1</sup>, that the small *S. pulla* was first seen, and thereafter, as is usual in such cases, they were seen quite commonly in the well-lighted, sand-loam, sagebrush clearings. Like the larger wasps, *pulla* was busiest during the early morning hours from 6:00 to 8:00, but many were still to be found digging, stocking, and attending burrows until noon. In general, however, they spent the cooler parts of each day—early morning and late afternoon—at their labors, and rested during the hot mid-day. Their behavior can be more specifically related by considering the three most important nests individually.

NUMBER 1. This wasp was first seen flying energetically about a small clearing in which six large *Chlorion laeviventris* were working. After examining the terrain in a series of confusingly swift dashes, she alighted and gave the loose soil several quick, experimental strokes, then abandoned the spot and made another series of observations. She repeated this four times before finally selecting a spot near the edge. Now, at 9:10 a.m., she proceeded to dig in earnest. Her mandibles worked the soil loose when it refused to be torn away by the swiftly-moving forelegs, and the latter scooped loose dirt backward, sometimes in a flowing arc, beneath the body. If soil detritus had a tendency to pile up, it was given added impetus by the middle and hind legs in turn. At intervals, the wasp turned about and scattered the pile of debris in all directions, sometimes using her mandibles as a sort of bunting scoop, sometimes throwing it backwards beneath her body, meanwhile pivoting swiftly about to scatter it thoroughly. She made rapid progress with the tunnel, for the soil was easily worked, and soon she was spending the greater part of her time in the burrow.

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<sup>1</sup>Determined by Miss Grace Sandhouse.

Each time the wasp backed into the open to clean the tunnel, she rose into the air for a short observation flight, which generally consisted of flying directly up from the opening, hanging motionless in the air for half a second, then dropping back to disappear down the hole. However, this was only when everything seemed secure. If disturbed during these forays, she showed immediate concern and flew about in rapid jerks above the clearing until the source of the disturbance had passed. She was surprised several times by a *C. laeviventris* who was just finishing her own burrow only a foot and a half away. Upon such occasions, *pulla* refused to return to her tunnel until the larger wasp was back at her own. Towards *laeviventris*, and the still larger Mormon cricket, *Anabrus simplex* Haldeman, individuals of whom consistently blundered over her tunnel, *pulla* showed no direct animosity, merely keeping her distance until they had gone, but to other interlopers more nearly her own size, she showed her displeasure by darting at them in an effort to drive them off. An unidentified halictid bee, slightly larger than *pulla*, was thus pursued into an adjacent clearing.

At 10:27, one hour and 17 minutes later, the wasp had her burrow apparently finished to her satisfaction. During the next three minutes, she moved about over the ground at the entrance of the tunnel, and repeatedly scattered dirt in all directions. She alternated this with short trips into the nest, each time scratching in a little more dirt until she finally emerged and effectively plugged the entrance. After two high observation flights, she left the nest at 10:30.

At 10:54, *pulla* returned with a fly, which she clutched to her abdominal surface between middle and hind legs while hurriedly opening the tunnel with her forelegs, and disappeared within. She finally emerged at 11:04 and left, after closing the tunnel. At 12:45, she had not returned, and I was forced to conclude my observations of the nest.

NUMBER 2. This wasp had built her burrow before I came upon her, and was busily engaged in tending the wants of the grub which had, I learned later by digging up the nest, grown to considerable proportions. I noticed the wasp as she was preparing to re-open the nest and take in a fly. Emerging in four minutes, she closed the burrow and rose for a brief observation flight before disappearing. Fifteen minutes later, at 10:18 a.m., she returned with another fly, and deposited it in the burrow. I noted that she closed the entrance behind her with loose dirt,

effectively blocking it while she was inside. When she had left the second time, I dug the nest up, and found it to be 27 centimeters long, with a slight "U" turn, and a gradual gradient of descent from entrance to end. Here I discovered the large grub at the far end of the tunnel, among the customary debris of fly wings and dried sclerites. The two flies just added to the burrow proved to be the syrphid, *Helophilus latifrons* O. S.,<sup>2</sup> a common species in the vicinity. Among the older victims was a nearly intact *Sarcophaga tuberosa* Pand. (This sarcophagid is a consistent parasite of the Mormon cricket, but because of the latter's persistent cannibalism, the usefulness of the fly as a natural control is distinctly limited). I subsequently found many individuals of *tuberosa* in *S. pulla* nests, indicating that they were not uncommon.

NUMBER 3. This individual, like No. 1, was first seen preparing to dig her burrow. Her excavating behavior was, in general, much like that of No. 1, but the two instances in which her *modus operandi* differed are worthy of recording. While watching the wasp, I noticed a tiny shadow flitting about the tunnel entrance in characteristic fashion. Locating the owner, I found a very diminutive sarcophagid resting on the earth above the burrow opening. I was already familiar with these little parasites, having watched them at work on the larger *Chlorion laeviventris*. There are two species, *Eumacronychia elita* Townsend and *Euaraba tergata* (Coquillet),<sup>3</sup> which are indistinguishable in the field, and, as indicated by collected specimens, apparently equally common. Invariably, they were first brought to my attention by the motion of their shadow across the ground; they themselves are characteristically greyish and thus nearly perfectly camouflaged.

The fly flew up each time the wasp emerged from the tunnel, but returned when she had gone back in. Apparently, during this time, *pulla* was unaware of the presence of the parasite, for she ignored it entirely. She came out of the burrow again, and busied herself scattering debris. The fly flew off, staying longer than usual, and then returned to a *Gilia congesta* flower six inches from the working wasp. I had begun to wonder if *pulla* was as totally oblivious to these flies as was *C. laeviventris*, and had hoped that her smaller size might, in a manner of speaking, make her eyesight sharper. Nor was I disappointed. As the fly

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<sup>2</sup>Determined by C. L. Fluke.

<sup>3</sup>Determined by D. G. Hall.

alighted on the plant, her motion attracted the wasp. *S. pulla* rose into the air above the nest, hovered for an instant, then darted directly at the fly. The latter immediately flew up, then attempted to alight on the flower again, but the wasp swooped at her and drove her off. Beyond this bit of behavior, which I witnessed in other individuals of *pulla*, I have no further knowledge of the relationship between the two.

TABLE I. SUMMARY OF DATA FOR TWENTY-FIVE NESTS OF STICTIELLA PULLA (HANDLIRSCH) IN NEVADA.

Nest No.	Approximate Size of Grub	Approximate No. Victims	No. of <i>S. tuberosa</i>	No. of <i>H. latifrons</i>	Length of Burrow in Cms.
1.	medium	11	2	4	27
2.	medium	12	0	4	27.5
3.	small	4	0	1	26
4.	large	13	3	0	25.5
5.	large	16	0	3	27
6.	large	14	0	6	27
7.	large	14	1	9	28
8.	large	14	0	4	28
9.	large	19	3	7	29.5
10.	small	6	0	1	27.5
11.	small	5	0	2	27
12.	large	11	0	1	28
13.	large	17	2	5	25
14.	large	14	0	2	26.5
15.	small	3	0	0	27
16.	medium	8	0	1	27
17.	medium	9	1	1	26
18.	small	4	2	0	28
19.	medium	11	3	2	29
20.	medium	9	1	1	28.5
21.	medium	9	3	1	28
22.	medium	11	0	4	27
23.	large	16	1	2	27
24.	large	15	2	3	26.5
25.	large	18	1	6	27.5
Averages	small-20%	4.4	0.4	0.8	
	medium-32%	10.0	1.25	2.25	
	large-48%	15.08	1.08	4.0	
Total Average		11.32	1.0	2.8	27.32

In view of the fact that the wasp attends her growing larva daily, and brings it food until pupation, it would be extremely interesting to know just how the sarcophagids take advantage of this. Their procedure must of necessity be quite different from that employed in the parasitization of *laeviventris*, which is a comparatively simple matter involving few obstacles. When successful, they very probably enter the newly-completed burrow just after *pulla* brings in the first victim, upon which she deposits her egg. *Euaraba* and *Eumacronychia* larviposit (ever convenient for a parasite) and the young sarcophagids would be able, as in the case of *laeviventris*, to immediately destroy the host egg

and begin feeding on the supplied food. However, there are two very interesting points in connection with this possible parasitization upon which I have no data, and upon which hinges the entire success of the parasites.

(1) How do they get past the vigilant *Stictiella pulla*? Unlike *laeviventris*, this wasp is careful to close the nest each time she leaves, and there is not room for the fly to slide past her while the owner is in the tunnel. And I doubt that the fly could gain entrance while the wasp was clearing away debris from the opening, and then hide at the end of the tunnel without being detected.

(2) *Euaraba* and *Eumacronychia* always, in my knowledge of their *modus operandi* when parasitizing the larger *laeviventris*, deposited an average of 20 or more larvae upon or near the host egg. To do this with *Stictiella pulla* would be to defeat their own purpose, for it is not likely that this small wasp could feed that many sarcophagid larvae in their middle and last stages of growth. If successful here at all, the parasites must of necessity limit their larvae to one per nest. It would be relatively simple, from the author's knowledge of similar behavior in related wasps, to imagine *pulla* being duped into feeding one sarcophagid larva, but in the many established burrows which were dug up, nothing but wasp larvae was found, showing, very probably, that the vigilance of the wasp is a strong guarantee against this particular form of victimization.

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ERYNNIS LACUSTRA (WRIGHT) FROM NEAR THE TYPE LOCALITY  
(Lepidoptera, Nymphalidae)

On May 24, 1938, the writer took several specimens of this species, and saw others, about 14 miles from Middletown, Lake County, California, on the road to St. Helena. The terrain was mountainous and covered with a mixed forest. The insects were taken at the side of the road, where water was seeping from the road bank.

The type locality is given as Blue Lakes, Lake County, California. While Middletown is quite a few miles from the Blue Lakes, it is in the same general region. It is interesting to note that practically all the specimens of this species that are found in collections, have been taken in southern California. Mr. Lowell Hulbirt of Glendora, California, has taken them in considerable numbers in the Mohave region.

The specimens from Middletown represent the nearest approach to topotypical specimens that I have seen.—J. W. TILDEN.